

**Syllabus
for
Horticulture, Forestry, Seed
Science, Rural Technology,
Agronomy, Plant Breeding,
Genetics (SCQP16)**

Note:

- i. *The Question Paper will have 75 questions.*
- ii. *All questions will be based on Subject-Specific Knowledge.*
- iii. *All questions are compulsory.*
- iv. *The Questions will be Bilingual (English/Hindi).*

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Basic Biology: Spontaneous generation theory, prokaryotes vs eukaryotes, functional anatomy, structure and organization of bacteria, fungi and algae – economic importance, methods of sterilization, rhizosphere microorganisms and importance, plant-microbe interactions in soil, microbial transformation of nutrients in soil. Carbohydrates, lipids, proteins and amino acids – occurrence and classification, carbohydrate and lipid metabolism, glycolysis, TCA cycle, pentose phosphate pathway, ETC and oxidative phosphorylation, secondary metabolites – occurrence, classification, functions and applications.

Ecology: Physical environment; biotic environment; biotic and abiotic interactions. Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement. Characteristics of a population; population growth curves; population regulation; life history strategies; concept of metapopulation – demes and dispersal, intergeneric extinctions, age structured populations. Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis. Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Types; mechanisms; changes involved in succession; concept of climax. Structure and function; energy flow and mineral cycling; primary production and decomposition; structure and function of some Indian ecosystems: terrestrial and aquatic. Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

Plant Biology: Photosynthesis: Light harvesting complexes; mechanisms of electron transport; photo protective mechanisms; CO₂ fixation-C₃, C₄ and CAM pathways. Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photo respiratory pathway. Nitrate and ammonium assimilation; amino acid biosynthesis. Plant hormones: Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action. Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks. Solute transport and photo assimilate translocation: Uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photo assimilates. Secondary metabolites - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles. Responses of plants to biotic and abiotic stresses; mechanisms of resistance to biotic stress and tolerance to abiotic stress. Plant tissue culture and applications, molecular marker technology, transgenic technology – GMOs, transgenic plants for biotic and abiotic stress resistance and quality improvement, molecular pharming – production of vaccines, therapeutic proteins, industrial enzymes and bioplastics.

Microscopic Techniques: Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.

Methods in Field Biology: Methods of estimating population density of animals and plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization-ground and remote sensing methods.

Horticulture: Scope and importance; global scenario of horticultural crops, classification of horticultural crops – nutritive value of horticultural crops, horticulture zones of India. Systematic botany – terminology, morphology description and classification of root, stem, leaf, inflorescence,

Flower and fruits – flowering mechanism – modes of pollination – asexual/ vegetative reproduction – floral biology – fertilization and fruit set, Principles involved in nomenclature.

Landscaping and Gardening: Importance and scope of gardening, gardens in India – concepts of landscape gardening – styles and types of gardens – Hindu, Mughal, English, Italian, Persian and Japanese gardens, ornamental landscaping in environmental protection.

Food Technology: Food processing industries/institutions/food scientists of importance in India, causes of food spoilage, methods of food preservation, post-harvest and storage of fresh fruits and vegetables, preparations of fruits and vegetables for processing, technology of foods of animal origin.